Hunters, herders and hearths: interpreting new results from hearth row sites in Pasvik, Arctic Norway

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Abstract: The transition from hunting to reindeer herding has been a central topic in a number of archaeological works. Recently conducted archaeological investigations of two interior hearth row sites in Pasvik, Arctic Norway, have yielded new results that add significantly to the discussion. The sites are dated within the period 1000-1300 AD, and are unique within this corpus due to their rich bone assemblages. Among the species represented, reindeer is predominant (87 %), with fish (especially whitefish and pike) as the second most frequent category. Even sheep bones are present, and represent the earliest indisputable domesticate from any Sami habitation site. A peculiar feature is the repeated spatial pattern in bone refuse disposal, showing a systematic and almost identical clustering at the two sites. Combining analysis of bone assemblages, artefacts and archaeological features, the paper discusses changes in settlement pattern, reindeer economies, and the organization of domestic space.

Key words: heart rows; Sami archaeology; reindeer; sheep; hunting; herding; bones; zoo-archaeology.

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Introduction

During the Viking Age and Early Medieval Period (c. 800 – 1300 AD) some remarkable changes took place among the Sami hunting societies in northern Fennoscandinavia. Settlement sites were established in previously little explored environments and were significantly restructured in terms of dwelling design, site layout, and the organization of domestic space more generally. Ritual and religious practices intensified and took on new and more distinctive forms as reflected in sacrifices and burial customs. What is especially curious about these changes, which also included new and stylistically distinct artifact assemblages, is that they were highly interregional and thus indicate that shared practices and common material features spread rapidly over a vast territory.

A conspicuous example of these changes is the so-called hearth row sites consisting of large rectangular hearths organized in a linear pattern (Hamari 1996, Hedman 2003, Hedman & Olsen 2009, Halinen *et al.,* 2013). Interpretations of these sites have varied, including an initial and quite persistent interpretation of them as cremation burials (Simonsen 1979, for an overview see Hedman & Olsen 2009). More recent research, however, has seen the hearth row sites in connection with concurrent inter-ethnic and

social "turbulences" in the Viking Age and Early Medieval Period, emphasizing "stress" factors such as increased competition over land and resources, the need for consolidation of ethnic identity and rights, and/or masking of an emerging social inequality within Sami societies themselves (Hedman and Olsen 2009, Halinen *et al.,* 2013). Another crucial issue in the discussion of these sites is the question about possible changes in reindeer economy. More specifically, whether the new settlement pattern and environmental preferences can be related to a transition from hunting to reindeer herding; a discussion stirred also by the so-called "Stallo" house sites; similarly spatially organized sites that at the same time came into use in the northern Norwegian-Swedish mountain region (Mulk 1994, Storli 1994, Hedman 2003, Liedgren *et al.,* 2007, Liedgren & Bergman 2009, Sommerseth 2011).

In this paper we shall present new results from two recently investigated hearth row sites in Pasvik, Arctic Norway (Figure 1). The sites contain clearly defined structural features, rich artifact assemblages, and are unique within this corpus with respect to their well-preserved faunal remains. Moreover, taking into account that the investigations conducted are more extensive, detailed, and geographically focused than any previous investigations of hearth row sites, the investigated sites yields a great potential to scrutinize the intriguing changes taking place in Sami societies during the period in question. The main emphasis in this paper is on the faunal assemblages and after briefly presenting the material from the two sites, we shall proceed by discussing the observed features in relation to settlement pattern, economy, and the organization of domestic space.

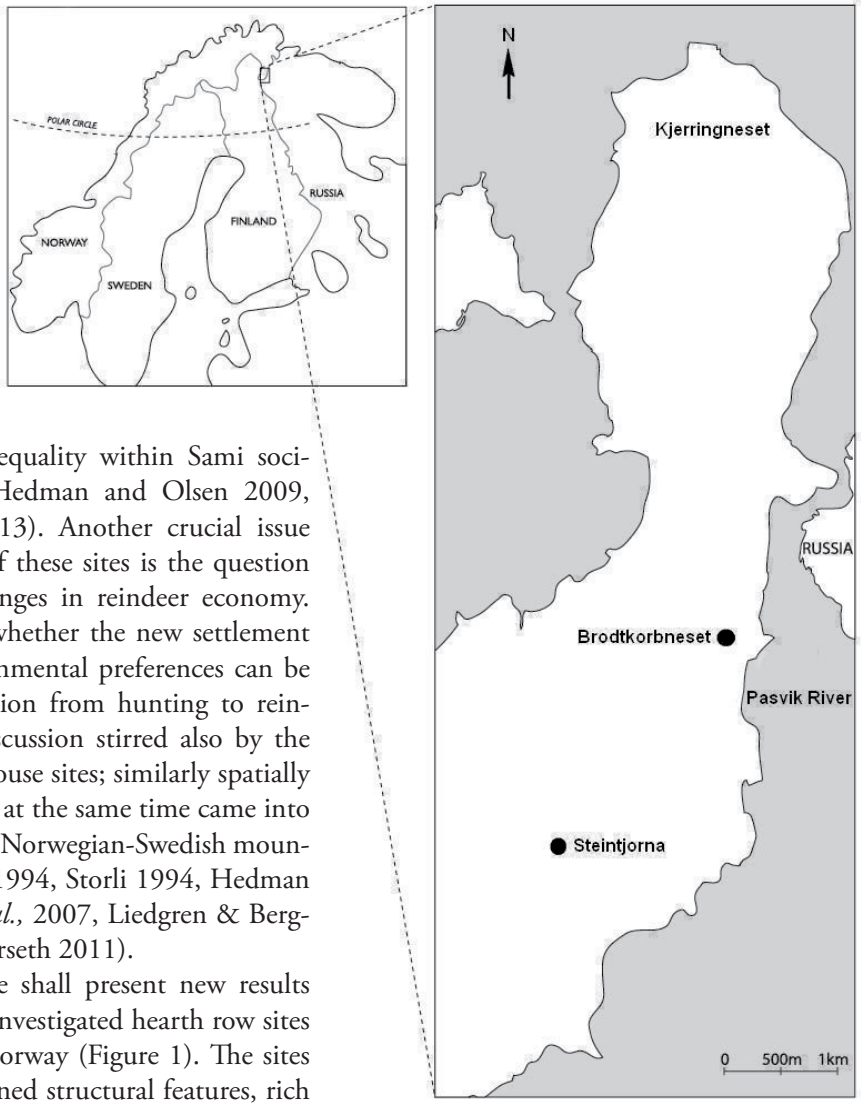

Figure 1. Location of the study area with the investigated sites marked.

Hearth row sites

A hearth row site is defined as a set of three or more equally oriented and regularly interspaced hearths organized in a linear pattern (see

Figure 2). The sites normally consist of 3 – 8 hearths, though sites with as many as 14 hearths have been recorded. The hearths are large, normally rectangular, and may measure as much as 2.6 x 1.5 m. They are usually very solidly built, consisting of large frame stones, and with compact stone packing inside. At some sites, however, the internal stone packing is lacking (cf. Sundqvist 1973, Hedman 2003, Halinen *et al.,* 2013), suggesting possible functional or seasonal variations. The hearths often show traces of intense firing and were most probably used inside a dwelling structure (Hamari 1996, Hedman & Olsen 2009).

The hearth row sites started to emerge around 800 AD. They became especially numerous and widespread during the late Viking Age and Early Medieval Period, while around 1300 AD their use seems to have discontinued rather abruptly. The sites are found over most of the interior region of northern Fennoscandinavia, which embraces northern Finland, northern Sweden and northern Norway. Most likely their distribution also includes NW Russia, and in particular the Kola Peninsula, though their presence here has yet to be confirmed. A find of a hearth row site at Aursjøen, Lesja, Norway, suggests that their distribution also may have extended to the mountain areas of southern Norway (Bergstøl 2008: 141-142). Within their vast distribution area, hearth row sites are found in several environmental zones. They appear within the mountain birch forest zone as well as in the lower woodland, and some sites have also been found in coast-near areas in Norwegian Finnmark. Their main distribution, however, is within coniferous woodland away from the coast and below the high mountain region. The most typical hearth row habitat is pine forest with rich sources of reindeer lichen. Such lichen woodland has for millennia formed important winter pastures for wild as well as domesticated stocks of reindeer.

The environmental setting of the hearth row sites differs from that considered typical for earlier prehistoric settlements in the interior, and thus indicates a change in location preferences (Hedman 2003, Hedman & Olsen 2009). While earlier sites mostly are found along the shores of lakes and larger rivers, the hearth row sites normally appear in what may seem more marginal forest areas away from the major bodies of water. The sites are typically situated on dry moraine outcrops in marsh areas, on forested terraces or next to small creeks and tarns often surrounded by heathland rich in reindeer lichen (Hedman 2003:50). Such areas are ideal for pastoral winter habitation, they provide rich hunting grounds, and also afford good conditions for storing food in cold caches during summer.

Despite the numerous excavation conducted at hearth row sites no clear traces related to possible dwelling superstructures, such as post holes or wall remains, have been found. However, based on the spatial patterns that emerge from distribution of finds, cultural layers, and soil chemical signatures, there is ample evidence to suggest that the hearths were part of a circular dwelling structure. Given the lack of traces of more permanent building features, the most likely candidate for such a dwelling is a tent; a transportable superstructure combining light poles and hides or rugs. It may be objected that the floor space of the historically known Sami tent is far too small to accommodate such large hearths. There is, however, a significant difference between the light, conical *lávvu* used by the Sami used during summer and seasonal migrations and the more solid winter tent (*goahti*). The latter was constructed using a framework of paired curved poles (*baeljek*) that gave the winter tent a larger and more oval floor outline that could even fit big hearths. A large winter tent of the *goahti* type thus seems a likely option when discussing the possible tent superstructures that may have housed the rectangular hearths (Hedman & Olsen 2009,

Halinen *et al.,* 2013). From what has been inferred from the intensity and distribution of finds, as well as soil chemical mapping (primarily of phosphate), the human groups associated with each hearth were small, most probably consisting of a nuclear family. The hearth rows may thus be seen as representing co-residing households.

The Pasvik sites

The Brodtkorbneset and Steintjørna sites are both located at the Norwegian side of the Pasvik River, which constitutes the border between Norway and Russia. The sites are situated approximately 70 km from the coast and are the north-easternmost hearth row sites hitherto known. However, as mentioned, given their location a stone throw from the Russian border it is more than likely that their distribution continues on the Kola Peninsula. The sites were investigated in 2008-2009 (Brodtkorbneset) and 2012-2013 (Steintjørna), and included excavations, mapping, and soil chemical sampling.

Brodtkorbneset is the northernmost of the two sites, and consists of seven linearly organized hearths placed at intervals of 8 to 15 m (Figure 2a).

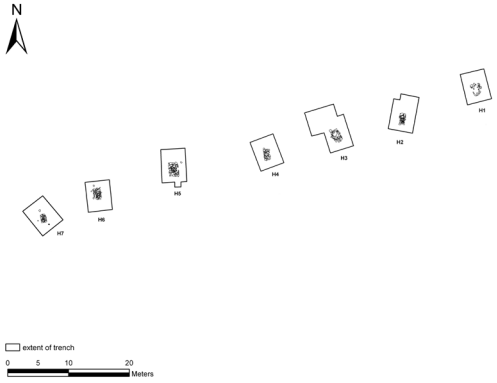

Figure 2a. Site plan of Brodtkorbneset, illustration Radek Grabowski.

Though relatively close to the Pasvik River, the site is located away from the riverbank on a sandy terrace. The "distancing" from the river is also manifested by the fact that the hearth row is oriented approximately east-west and thus perpendicular to the orientation of the river. The vegetation in the area consists predominantly of lichen, moss, heather, and pine trees. All the hearths are rectangular and contain packed and partly layered stones enclosed by larger frame stones. Oriented perpendicularly in relation to the overall linear outline of the site, the length of the hearths lay within the range of 1.5-2.4 m, width between 1-1.2 m, and they reach a maximum height of 0.4 m above the surface. All the seven hearths were excavated, including the living areas around them (trenches varying in size between 20 and 36 m²). Some of the hearths contained a top layer of very compact, sintered soil ('hearth concrete') rich in fragments of burned bones. Another common feature, though most manifest in the largest hearths, was that the northern end was built higher using larger stones, creating a platform-like compartment (Hedman & Olsen 2009: 9). In addition to the hearth trenches, four test pits were dug in areas intersecting the hearths.

The Steintjørna site is located 4 km SSW of Brodtkorbneset and 700 m west of the Pasvik River. The north-south oriented hearth row contains eight hearths and is situated 80 m east of a small tarn (Steintjørna), on moss and heather covered moraine ground in mixed birch and pine forest. The linear outline is as regular as at Brodtkorbneset and the distance between the hearths varies between 5 to 18 meters (Figure 2b). Regarding the general layout, size, morphology and stratigraphy of the hearths, the site is very similar to the Brodtkorbneset site. One hearth, H7, however, sets itself apart by being constructed primarily of slate slabs in contrast to the boulders otherwise used. It is curious to note that both sites exhibit

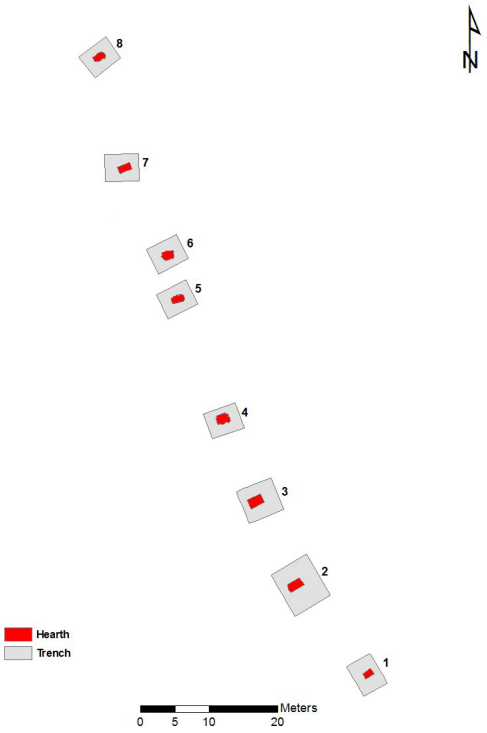

Figure 2b. Site plan of Steintjørna, illustration Philip Jerand.

some degree of internal "hierarchy", with some hearths being bigger and more solidly built, and also yielding more finds than the other. These larger and richer hearths are never terminating the rows and especially at Brodtkorbneset there seems to be a "preference" for the central part of the line.

Twenty-nine radiocarbon dates have been obtained from bone and charcoal samples from Brodtkorbneset, and twenty-three from Steintjørna (Figure 3) (see also Table 7 and 8). Apart from one unburned sheep bone, the bone samples consist of burned and unburned reindeer bones, while the charcoal samples mostly stem from selected branches and outer growth rings of pine, the only tree species present in the material. The use of different dating materials enable better control and critical evaluation of the

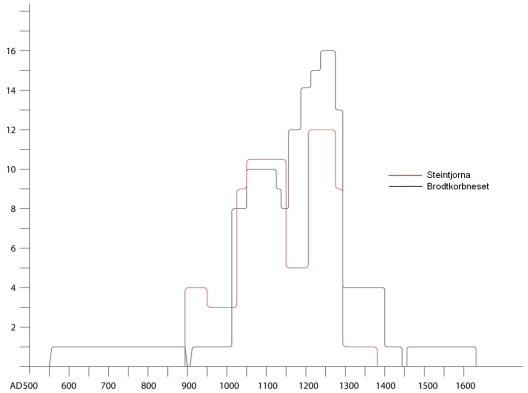

Figure 3. Diagram showing calibrated AMS radiocarbon dates from Brodtkorbneset and Steintjørna. Radiocarbon ages calibrated using OxCal 4.2 (Bronk Ramsey 2009).

results, including possible "old wood" effects, which often apply to interior sites where dead pine often is used as fuel. With a few exceptions the dates cluster rather nicely and suggest that the sites were most likely in use sometime between the late 11th and late13th century. Moreover, though the available results do not allow for any resolution at decade level, the radiocarbon dates do not indicate any internal chronological differences between the hearths at the two sites. The regularity in the overall organization and design of the sites also supports an interpretation of cohabiting household.

Artefact assemblages

The excavations at Brodtkorbneset resulted in 196 artefacts (Table 1), the majority of which consist of cut pieces of bronze or copper alloy (20 %) and (tinder) flint (32 %). Thin pieces of cut bronze or copper alloy are commonly found at both Sami sacrificial sites and dwelling sites, and have a wide chronological distribution from the Late Iron Age to early modern times (Serning 1956; Carpelan 1975, 2003; Zachrisson 1976, 1984; Odner 1992; Hedman 2003). Their local importance is witnessed by the fact that they are often worked into ornaments such as trapezoid and axe shaped pendants (Serning

Table 1. The artefacts from Brodtkorbneset.

Find	H1	H2	H3	H4	H5	H6	H7	Test-pit1	Test-pit2	Test-pit4	N=
Iron fragment		12	3	2	13	1	4				32
Iron nail		1	1	1	1						4
Iron rivet		1			2						3
Iron ring			1								1
Iron strike-a-light					2						2
Iron fishhook					1						1
Iron axe			1								1
Iron rod							1				1
Iron arrowhead		1			3						4
Iron scraper					1						1
Iron knife					1						1
Bronze brooch				1			1				2
Cut copper alloy	8	4	7	7	12	2	1			1	42
Trapetzoid pendant, copper alloy			2	2	3	1			1		9
Axes-shaped pendant, copper alloy	1							1			2
Pendant, copper alloy		1									1
Copper rivet	1		1								2
Flint		6	9	2	29	3					49
Mica			3								3
Whetstone	1	2			2	2	1				8
Quartz flake	1	1	2	2							6
Quartzite flake		1	2								3
Pumice stone, polished		1									1
Hammerstone							1				1
Asbestos ceramic	1	1	5				2				9
Bone comb			1								1
Melt					1						1
Total	**13**	**32**	**38**	**18**	**71**	**9**	**11**	**1**	**1**	**1**	**=196**

1956; Zachrisson 1984). A total of ten of these locally produced pendants were found at Brodtkorbneset. Two imported bronze brooches were also found, most probably originating from the Ladoga area in Russia (cf. Makarov 1991, Ovsiannikov 1993). The flint debris is characteristic of flint struck by strike-a-lights in order to produce sparks and fire.

Among the other artefacts were four arrowheads, two strike-a-lights, an axe, a hide scraper, a knife and a fishhook, all made of iron. Bone/antler artefacts were very rare, though a fragmented composite comb was found and the iron knife contained a partially preserved bone shaft. As with the bones, the artefacts were unevenly distributed among the hearths, with the central hearths being the richest. It is interesting that a 'mundane' artefact such as a tinder flint, while numerous in the deposits from the central hearths, was completely lacking from the two outermost hearths (H1 and H7) (Hedman & Olsen 2009).

The artefact finds from Steintjørna counts 167 entries (Table 2), and also at this site the majority consists of cut pieces of copper alloy (26 %) and (tinder) flint (16 %). Most of the copper alloy

Figure 4. Finds from Brodtkorbneset and Steintjørna 1. Bronze ornament, photo Bjørnar Olsen; 2. Bronze horse head fragments, photo Bjørn Hatteng; 3. Axe shaped pendant (copper), photo Bjørnar Olsen; 4. Iron arrowhead, photo Tromsø museum.

Table 2. The artefacts from Steintjørna.

Find	H1	H2	H3	H4	H5	H6	H7	H8	N=
Iron fragment	1	4	10		5		1	1	22
Iron knife	2	4		1		1			8
Iron rivet		4	1		2				7
Iron arrowhead	1	2?	1?						4
Fragment of iron chain		1	1						2
Iron blank		2							2
Iron rod			1						1
Iron hanger		1							1
Weight			1						1
Bronze horsehead			1					1	2
Bronze needle		1							1
Cut copper alloy		25	4	3	3	3	2	1	41
Trapetzoid pendant, copper alloy								1	1
Slag		32						1	33
Plano convex slag					1				1
Hammer scale		2			3				5
Burned clay					2				2
Glass bead					1				1
Flint	1	4	7	9	3	2	1		27
Rounded stone		1							1
Mica			1						1
Whetstone			1						1
Quartz					1				1
Tree resin glob/ "chewing gum"								1	1
Bone awl				1					1
Total	**5**	**83**	**29**	**14**	**20**	**6**	**4**	**6**	**=167**

pieces were found in association with H2, and in contrast to Brodtkorbneset some of the pieces are quite large and a very low portion worked into ornaments/pendants. Among the more peculiar finds are two small horse heads in bronze (Figure 4), which originally have been part of a horse-shaped pendant containing two opposite facing heads. The heads from Steintjørna were not found together, however; one was found in H8 while the other was found 60 m to the south, next to H3. Thus we do not know for sure whether they onces formed part of the same pendant. As with many of the ornaments from the Viking Age and Early Medieval Period found at Sami sites, also this kind of pendants was produced in the Lake Ladoga area, Russia, during the 11th to the 13th century (Kivikoski 1973:140). Another interesting find is an oval lead weight with an outer covering of copper alloy found next to H3. The form and the heaviness suggest that the weight has been used as a balance in order to measure precarious metal, most likely silver. Interestingly, four nearly similar weights were found at another hearth row site, containing 10 hearths, in the woodland of northern Sweden (Hedman 2003:161), and speak to the Sami's direct involvement in trade. Other finds from Steintjørna included iron arrowheads and knives, a bronze needle, and a fragment of a glass bead.

One significant difference in the assemblages from the two sites is the finds related to metal processing from Steintjørna. Slag actually counts for 20 % of the finds, but was curiously not present at all at Brodtkorbneset. Most of the slag was found in association with H2 (more than one kg), and lesser amounts were also found at H5 and H8. The slag finds include hammer scales and plano convex slag, and the uneven distribution between the hearths may indicate specialist skills not shared by other members of the community. The fact that the archaeo-metallurgical analysis conducted of the slag showed an unusual complex metal processing, involving a mixture of copper and iron (Grandin & Willim 2013), may further support this interpretation.

The faunal material

The faunal material from Brodtkorbneset and Steintjørna consists of more than 17000 bone fragments with a total weight of nearly 16 kilos (see table 3). This is no doubt a comparatively large assemblage from an interior Sami dwelling site, since the common acid soil in the interior

Table 3. Amount of animal bone fragments in the different hearths from Brodtkorbneset and Steintjørna.

Site	Hearth	Number of fragments	Total weight in gram
Brodtkorbneset	H1	141	59,2
Brodtkorbneset	H2	165	335,1
Brodtkorbneset	H3	5240	7604,0
Brodtkorbneset	H4	1369	563,5
Brodtkorbneset	H5	3447	2741,8
Brodtkorbneset	H6	546	311,1
Brodtkorbneset	H7	264	458,5
Steintjørna	H1	494	188,5
Steintjørna	H2	572	384,3
Steintjørna	H3	2254	2317,2
Steintjørna	H4	775	335,9
Steintjørna	H5	666	325,3
Steintjørna	H6	672	170,9
Steintjørna	H7	230	203,1
Steintjørna	H8	228	141,2
Total Sum		**17063 fragments**	**15681,1 gram**

normally provide poor preservation conditions (Sommerseth 2009:256; Mulk 1994:176). It should be noted, though, that most of the fragments are burned and quite small, which limits the information one can get out of them. Still, data from the osteological analysis, such as abundance of different species, distribution of anatomical elements, age and gender assessment etc., provide important contributions to the discussion about subsistence and seasonality among other issues addressed to the material (Vretemark 2009; 2010; 2013a; 2014).

The amount of bones found in the separate hearths differs, from around 50 grams up to more than 7 kilos. The reason for this is not clear but it is intriguing that the hearths in the mid part of the row at both Brodtkorbneset and Steintjørna have yielded the largest samples, both in weight and in fragment numbers

Table 4. Number of identified bone fragment per species in the different hearths.

	Brodtkorbneset							Steintjørna								
	H1	H2	H3	H4	H5	H6	H7	H1	H2	H3	H4	H5	H6	H7	H8	Sum
Reindeer *Rangifer tarandus*	82	70	1243	204	504	85	105	47	142	552	92	135	50	59	68	3438
Sheep/goat *Ovis/Capra*			17		1					1	1					20
Artic fox *Alopex lagopus*					7											7
Wolf *Canis lupus*					1											1
Wild duck *Anadinae*					1											1
Willow grouse *Lagopus lagopus*			1													1
Black grouse *Lyrurus tetrix*				1							1					2
Capercaillie *Tetrao urogallus*									1		1					2
Hazel grouse *Bonasa bonasia*										5						5
Common whitefish *Coregonus sp*			95	2	83	2			30	94	3	1	7			317
Grayling *Thymallus thymallus*			4	4	6											14
Salmon *Salmo salar*				1				1								2
Pike *Esox lucius*	6	2	13	1	32		3	2		20					2	81
Cod *Gadus morhua*				1	2											3
Carp fish *Cyprinidae sp*				1									1			2
Fish unspec.			7	14	41	2										64

(Table 3). Burnt bones fragments are concentrated within the hearth and consist mainly of smaller fragments of reindeer bones as well as fish bones (mostly vertebra). Unburned or just slightly burned bones are mostly found in smaller or larger concentrations outside the hearths.

There is a clear predominance of reindeer in the assemblages (Table 4). In the merged material from all the hearths no less than 87 % of the identified fragments consist of reindeer. The amount of fish bones is also quite impressing making up a total around 12 %. The remaining 1 % represents bones of birds and some fragments of artic fox, wolf and sheep/goat. Six different fish species were identified. Most frequent among these were common whitefish followed by pike. In addition a few fragments from grayling, salmon, some carp fish and cod were found of which the latter is the only undisputable indication of sea fishing activities. Taking into consideration that fish bones always will be underrepresented compared to more persistent bones from larger species, the amount of fish bones is significant and stresses the importance of fish as a vital food resource.

The bird findings consist of a few bones of willow grouse, black grouse, hazel grouse and capercaillie. These are birds that are available throughout all seasons and could be hunted most preferable in the forest zone. The only other bird species represented is duck, and only with one bone.

Economy and settlement pattern

Discussing economy and settlement pattern, one important issue to address is seasonality; at which time of the year the two sites were in use and whether they represented the same or different seasons. The evidence provided by the faunal material gives some significant clues, especially with regard to the marked seasonal changes in species occurrence in the north. It is, however, also important to bear in mind that since food was preserved for winter storage the season of catching does not necessarily match the time of consumption. Sometimes the absence of species will tell more in this matter than their presence.

Bird hunting evidently played a part in subsistence, even if a minor one, and the faunal remains especially from Steintjørna show that sedentary forest birds such as different grouse and capercaillie were hunted. More significant for the question of seasonality, however, is the almost total absence of migrating spring and summer birds. Especially the absence of ducks, geese and swans is significant, since these species traditionally were important among the Sami (Lillienskiold 1698: 188-90, Fellman 1906: 72). The only exception is the single finding of a wing bone from duck in hearth 5 at Brodtkorbneset. It is also interesting to note that despite identification of hundreds of reindeer fragments, not a single bone from very young calves was found. Even if this age category normally was not hunted or slaughtered, some bones from suckling calves would probably be expected if the sites were in use during the calving season (May-June). Based on these absences it seems unlikely that the sites were in use during the period from late April to September. The few finds of bones of wolf and artic fox at Brodtkorbneset may also speak in favor of winter settlement. While these sedentary species are inconclusive in terms of seasonality themselves, they were preferably hunted in the cold season due to the superior quality of the winter fur.

These "cold season signatures" in the faunal material comply well with some of the archaeological data. The size and solidity of the hearths, traces of intense firing, and the stone packing inside the hearth, speak to dwellings where heating and heath storage were crucial. The location and orientation of the Brodtkorbneset site, which is situated quite close to the bank of the Pasvik River (the closest hearth is

just a little more than 100 m away), may further support this. Despite this relative proximity, the placing and layout of the hearth row seems to "ignore" the river's presence and spatial guidance, and seems more in compliance with dwelling in a blurred winter landscape where also snow conditions may be more favorable on the chosen, elevated terrace.

Settlement pattern and the ethnographic record

If we think of winter as the most important season of settlement, it seems feasible to bring to the discussion the historically documented seasonal pattern of the local Sami community, the Skolt Báhceveaj/Pasvik siida, who until the early 20th century used this very area as part of their territory. The winter village (*Talvsijd*), used from December to April, was the aggregate site for the entire community which dispersed into family based units during other seasons, of which spring and summer were spent in the coastal region. The winter village was located in the interior of the Pasvik River Valley but, interestingly, always at a distance away from the river (Keilhau 1831: 43; Tanner 1929: 105-139). The community mostly lived on stored food reserves, and access to reindeer pasture and firewood were the main factors determining the location of the winter site. However, due to its impact on the surrounding pasture and forest the winter village was moved at intervals of 5-30 years (Tanner 1929: 104-106; cf. Nickul 1948: 54-56).

The settlement system of the Báhceveaj siida thus seems to provide a plausible model for interpreting the seasonality and settlement pattern of Brodtkorbneset and Steintjørna. The fact that the two sites are remarkably similar in most respect, and hardly chronologically distinguishable, fits well with the pattern of short interval "moving" winter villages, which also may have included a third and yet unexplored hearth row site situated north of Brodtkorbneset. The amount and variety of finds fit well with a communal site occupied during a substantial (winter) period, and the number of hearths is also surprisingly well in accordance with the recorded number of household in Pasvik and neighboring siidas in the 16th and 17th century (Qvigstad 1925: 7; Tanner 1929: 305-310; Tegengren 1952: 33-34). Moreover, the general spatial organization of the sites speaks in favor of aggregate sites for the local community rather than smaller, family-based camps. In addition, bones of ocean fish such as cod and salmon[1] in the faunal material, as well as finds of pumice stones, may indicate movement to the coast during summer and thus a settlement pattern resembling to the one documented historically for the Báhceveaj siida (Tanner 1929; Olsen 1984:142-157).

Much data thus support the interpretation of these hearth row sites as communal sites used during the cold season. There are, however, also features that comply less well with the ethnographic winter village model and which needs further consideration. The substantial amount of fish bones in the hearths indicates the importance of fishing. Common whitefish are most numerous, represented by a great number of bone fragments from vertebrae and cranium, while pike is the second most important fish, consisting mostly of medium-sized specimens of 50-60 cm length. What is curious about the pike remains is that the vertebrae are missing except from the ones close to the caudal fin. Cranial elements were found, however, and the lack of the flesh-rich body parts strongly suggests that the pike was processed at the sites but aimed for consumption elsewhere. Drying was the most common way to preserve fish, which also facilitated easy transportation due to the considerably reduced weight. From later times we know that pikes and other fish were split up in order to speed up the drying process, leaving characteristic butchering marks. Interestingly,

[1] Salmon cannot pass Skoltefossen, the waterfall close to the mouth of the Pasvik River, 60 km to the north. Salmon is also evidence of summer fishing.

identical cut marks were found in this material on front portion of the pike jaws, which strongly suggest such procurement for drying (Figure 5).

Figure 5. Cut marks on front portion of pike jaws, photo Maria Vretemark.

While whitefish and pike may have been caught during winter using nets under the ice, lake and river fishing was most commonly carried out during spring and fall (Tanner 1929: 125, 134-137; Nickul 1948: 21-53). The fall spawning season for pike and whitefish was especially important, which also is the likely season for drying. The fish material thus suggests that the sites were used also prior to the winter season, either as part of a continuous stay or as temporarily visited. It is, however, intriguing that the dried pike was only processed at the sites and not used for winter reserves during the succeeding and presumed main season of occupation. One possibility is that the pike was processed specifically as a trade or tax item, a use that is well documented from later periods in the area (e.g. Tegengren 1952: 21). The eastern ornaments found at the sites, as well as the weight from Steintjørna, clearly indicate trade connections, and the faunal remains may indicate that dried fish was among the products traded[2].

Reindeer: hunted or herded?

Reindeer is the by far most dominant species in the faunal material from Steintjørna and Brodtkorbneset. The identified bones represent all different parts of the carcass (see Table 5), and bones from meaty body parts as well as from less meat-rich parts were found in all hearths. There is a slightly less proportion of cranial fragments than would have been expected and antlers are notable quite sparse. The reason for this is uncertain but may be due to special treatment of the reindeer cranium, including ritual uses (Odner 1992: 58, cf. Iregren 1985, Olofsson 2010). In Finnish Lapland, for exam-

[2] *En passant* it may be mentioned, that the historically documented trade with the Sami usually took place during winter, the so called "winter markets", when snow facilitated transport on sledges and skis, and which may be read as a further support for the site's suggested seasonal affiliation

Table 5. Anatomical distribution of reindeer bones. Data from Vretemark 2009, 2010, 2013a, 2014 and Magnell 2001.

	Steintjørna	Brodtkorbneset	Kjerringneset R5
Calvarium	2	40	1
Antler	1	10	5
Mandibles	13	36	4
Loose teeth	16	51	3
Hyoideum		3	
Vertebra	55	139	16
Sacrum	2	2	
Sternum	1	2	
Ribs	416	369	
Scapulae	46	70	5
Humerus	32	132	14
Radius/Ulna	29	96	15
Carpalia	16	86	1
Metacarpal	39	136	9
Hip bone	17	75	6
Femur/Patella	48	90	8
Tibia/Malleolus	70	124	10
Tarsalia	35	89	56
Metatarsal	40	156	19
Metapodium	6	23	5
Phalanges 1&2	168	383	23
Phalang 3, hoof	27	73	5
Sesamoidea	38	94	2
Long bones unspec.	28	14	

ple, faunal remains from sacrificial sites have proved to be clearly dominated by reindeer cranial bones (Äikäs *et al.,* 2009, Nyyssönen & Salmi 2013:45). A common feature in the material is also that phalanges and metapodia from the lower parts of the extremities are well represented; something that has been noticed also in a previous analysis of slightly younger bone material from Pasvik (Magnell 2001). These are bones from skinny body parts, but where the content of fatty marrow compensates for the lack of meat. The pattern of element distribution in the faunal assemblages from Steintjørna and Brodtkorbneset is very consistent and without any significant variation between the hearths in this respect. The bones that ended up in the rectangular hearths thus suggest that the different households handled the reindeer carcasses very similarly both in terms of processing and consumption.

Ethnographic documentation of traditional reindeer slaughter among reindeer pastoralists in the 18th and 19th century shows that all parts, including meat, marrow and entrails, were taken care of and used (Drake 1918:56-58). Within a hunting economy, however, where the hunting grounds may be far from the dwelling site, weight may become a critical factor affecting what cuts to bring back. Thus, on dwelling sites more distant away from the hunting areas, predominance for bones from meaty parts have been noticed while bones from less meaty parts such as metapodials or phalanges are clearly underrepresented (Binford 1978, Hambleton & Rowley-Conwy 1997: 62-66). Bone assemblages from medieval professional mass hunt of reindeer in southern Norway show that the meat-producing parts of the carcasses were defleshed and the heavy bones thereby left at the slaughtering sites in the mountains in order to facilitate long transports (Indrelid 2013:67). This was evidently not the case at Steintjørna and Brodtkorbneset. Most likely the killing or slaughtering of the reindeers, and dismembering the carcasses, has been carried out quite close to the sites (or even perhaps at the sites), since also heavy bones like the thighbone or shinbone are well represented as well as bones from body parts with less meat.

This feature and the overwhelming dominance of reindeer in the faunal material trigger the "classical" question as to whether the reindeer were wild or domesticated? As already noted, the very location of hearth row sites may provide one clue, since their emergence strongly indicates new environmental preferences among the interior Sami societies. The fact that these sites are situated away from the previously preferred areas along riverbanks and major lake systems may indicate that access to reindeer pastures, and thus the importance of domesticated reindeer, had become imperative to site location (Hedman 2003, Halinen *et al.,* 2013). Moreover, if stocks of domesticated reindeers were kept close to the sites, as was the case with the Skolt Sami winter villages (Tanner 1929), any slaughtering of these reindeer would likely produce the pattern of evenly distributed body parts observed in the faunal material. Nonetheless, the presence of arrowheads in the excavated material shows that hunting still took place and - whether contemporary or not – the presence of pitfall system for trapping of wild reindeer in the vicinity clearly suggests that the area also contained good hunting grounds. In fact, collective hunting of wild reindeer in the area is recorded as late as the early 19th century (Rathke 1907: 159).

In order to approach this matter from a different angle we have looked at the age attributes in the reindeer bone material. While the often very fragmented condition of the faunal material retrieved from Sami sites in the interior allow for few if any assessments of age and sex (Hedman 2003:190), the material from Steintjørna and Brodtkorbneset

is far more promising, especially with regards to age assessments. Based on observations on epiphyses status in the long bones there is without any question a clear predominance of mature reindeer; 70-80 % where at least 4 years when killed. A little over 60 % were even 5 years or more (see Table 6 and Figure 6). Only a few percentage were less than 1,5 years of age and there were a total absence of very young calves. A strikingly similar result was obtained from the Sami site at Gaeccevajnjarga, at the Varanger coast northwest of Pasvik, and which is contemporary with or slightly younger than the discussed hearth row sites (Hambleton & Rowley-Conwy 1997: 59-61).

In what kind of reindeer economy would such a killing strategy be practised? In their discussion of the age composition in the material from Gaeccevajnjarga, Hambleton and Rowley-Conwy conclude that the predominance of mature adults "indicates that the reindeer were probably wild" (1997: 68). Their conclusion is based on comparative data from modern herding economies where many young and subadult reindeer are slaughtered. Opposite it is assumed that hunters would go for the adult animals, and preferable the males, with the highest yield of meat. This, however, is complicated by the hunting strategies applied. The use of pitfall systems and even stalking as practiced on crust snow during late winter (Fellman 1906: 60, Tegengren 1952: 105) are quite indiscriminate and would result in a far more differentiated yield. Neither should one assume that reindeer herders necessarily would select calves and younger animals for slaughter, as has become common in modern meat- and marked-oriented reindeer economies.

Documentation of traditional reindeer herding among Sami groups in northern Sweden in the 18th and 19th century describes a cropping strategy with essentially the same pattern as observed in the faunal material. Keeping small herds with only 10-15 animals they would normally slaughter 3-5 fully grown males in the autumn, sometimes also an older female (Drake 1918:55-56). In support of this speaks a zooarchaeological investigation from the Silbojokk site near Arjeplog in northern Sweden, dated to the 17th century. A total of 160 kg of mostly unburned bones were found at the site, the majority reindeer bones (Sten 1984:3; 1989:168). Interestingly the age profile of the Silbojokk reindeers displays exactly the same pattern as the data from Steintjørna and Brodtkorbneset; only a few juvenile individuals were identified and around 90 % of the reindeers were older than 2 year, while 70 % were more than 4 years (Sten 1989:173). It should be noted that Silbojokk was a miner settlement related to the Swedish crown's extraction of silver in the area. However, the local Sami population became highly involved in logistic activities, as workers and not the least as food suppliers. The reindeer bones in the faunal remains from Silbojokk therefore most probably reflect habits and cropping strategies typical among the local reindeer herders. The same age-profile pattern is also observed

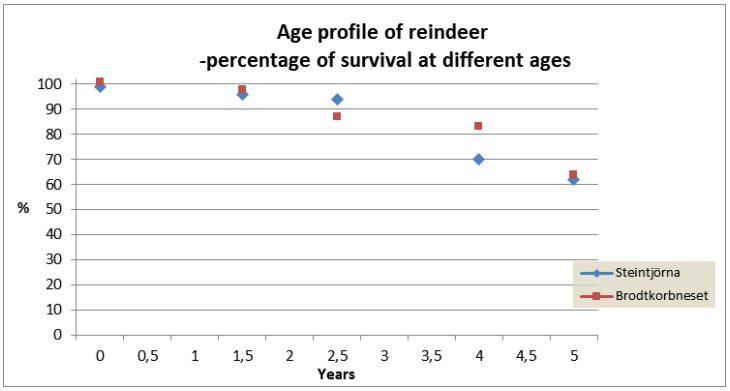

Figure 6. Kill off rate of reindeer, based on data in tab. 6. At 5 years there is a survival percentage of a little more than 60 %. Consequently only 40% of the reindeer turned out to be less than 5 years when slaughtered.

Table 6. Epiphysis fusion divided into three age groups based on if the epiphyses of different bones has early fusion, intermediate fusion or late fusion. Unfused epiphyses mean that the bone element is still growing. When fused the growing has stopped. The number of fused or unfused epiphyses of the different bone elements found in the hearths was recorded. The proportion between fused and unfused observations reveals the rate of survival at a certain age. More than 60% of the reindeers were at least 5 years when slaughtered or killed. Bone element age of fusion after Hufthammer 1995.

Reindeer Bone element	Steintjørna Status of epiphyses		Brodtkorbneset Status of epiphyses		Age of fusions, completed growth
	fused	unfused	fused	unfused	
Early fusion					
Humerus distal	7		36		Early fusion group at 1-1,5 yrs
Radius proximal	2		3		
Phalanges prox	44	2	167	5	
Total number	53	2	206	5	
	96%		98%		
Intermediate fusion					
Metapodials distal	18	1	72	14	Intermediate fusion group at 1-1,5 yrs
Tibia distal	11		21		
Calcaneus	3	1	10	1	
Total number	32	2	103	15	
	94%		87%		
Late fusion					
Humerus prox	3	2	3	1	Late fusion group at 3-4 yrs
Radius distal	5	2	16	4	
Ulna dist and prox		1	3	1	
Femur distal	3		3		
Femur proximal	1		6	1	
Tibia proximal	2	1	3		
Total number	14	6	34	7	
	70%		83%		
Vertebrae	18	11	25	14	Vertebrae fusion at 5 yrs
Total number	18	11	25	14	
	62%		64%		

in faunal material from other Sami sites in the Arjeplog area dating to late medieval and early modern time, when reindeer herding definitely was established (Vretemark 2013b).

Thus the dominance of adult reindeer in a faunal material might just as well, or perhaps even more likely, reflect small-scale reindeer herding. The cropping strategy would in that case include a yearly slaughtering of a few fully-grown male reindeers, including the surplus of younger male individuals of 2-4 years of age. The females would normally be kept longer and slaughtered at higher ages. This kind of reindeer herding, where small herds were kept close to the site, would also likely produce the pattern of equally distributed body parts observed in the faunal material. Reindeer hunting was still clearly important and rather than thinking of these economies as mutually exclusive, we should perhaps envisage a situation where hunting and herding were practiced alongside each other and where the new importance of herding is reflected in the new environmental preferences manifested by the location of the hearth row sites.

Herding sheep?

The presence of bones from sheep/goat in the material shows that the people of the hearth row sites were not unfamiliar with animal husbandry. A total of 20 such bone fragments were found in the hearths in both Brodtkorbneset and in Steintjörna (Vretemark 2009; 2014). It is hard to distinguish sheep from goat because the morphology of the skeleton is very similar. In those cases where clear species identification was possible it turned out to be sheep and it seems likely that all the small ruminant bones in the assemblages represent sheep. The presence of sheep indicates that domesticates actually were part of Sami consumption and economy quite early, as is suggested by data from medieval sites in northernmost Norway (Odner 1992, Hambleton & Rowley-Conwy 1997, Grydeland 2001, Amundsen 2011). While the latter all are costal sites, the finds from Pasvik are more surprising given the assumption that sheep (and cattle) was introduced quite late among the interior groups. One of the sheep bones from Hearth 3, Brodtkorbneset, has been radiocarbon dated to AD 990-1155 (Niemi *et al.,* 2013:4, see

Table 7), which makes this the so far the earliest undisputable domesticate from any Sami settlement site. The dating was conducted as part of a DNA study of native sheep breeds in Finland (Niemi *et al.,* 2013), where the Pasvik bone was included. The analysis places the specimen well within the range of the Finnish corpus, and although sheep genetic affinity can be geographically very widespread this may indicate that the introduction of sheep to Pasvik was connected to the general sphere of (south) eastern contacts and trade that emerged in the Viking Age and Early Medieval Period.

Though few, the anatomical distribution of the sheep bones indicates that the animals were slaughtered at the dwelling sites. This, however, does not necessarily mean that the groups using the hearths kept sheep. Living sheep, or even whole carcasses, may have been traded and brought to the site as part of exchange and trade. Still, it cannot be ruled out that the sheep bones represent early low scale animal husbandry. This would of course require a certain adaption in terms of need for shelter and winter fodder; however, as shown by the hybrid economy practiced by the local Skolt Sami in the 19th and early 20th century, this was far from incompatible with neither hunting nor reindeer herding. In fact, the latter acted as a prerequisite that helped facilitating sheep herding. The Skolt Sami primarily kept sheep for their wool, which was important both for cloths and rugs to cover tents. Since sheep are not well adapted for moving long distances in snow, the animals were transported from the winter to spring sites in sleds pulled by reindeer (Nickul 1948:67). Consequently, it may be argued that the presence of sheep (and goat), insofar they were kept at the hearth row sites, required a draft technology that involved domesticated reindeer. The fact that mainly young individuals are represented (Vretemark 2009: 8) may indicate the wool producing importance of older animals not selected for consumption.

Organization of household space

The most conspicuous feature in terms of organization of domestic space is of course the linear organisation of the hearths themselves (see Figure 2). The emergence of this peculiar and geographically uniform pattern of Sami site organization in the Viking Age and Early Medieval Period is indeed intriguing but beyond the scope of this paper to explore (for further discussion see Hedman & Olsen 2009, Halinen *et al.,* 2013). Instead, we shall focus on the repeated pattern in bone refuse disposal, which so far is only documented at the two hearth row sites in question. This remarkable spatial feature was first observed at Brodtkorbneset where the spatial distribution of bones found outside the hearths showed a clear and systematic clustering to the north (end) side of all the hearths. Intriguingly, exactly the same pattern was observed for the eighth hearths at Steintjørna, were the bones were clustering next to the east end of the hearth (the hearths here are oriented E-W, Figures 7 and 8). Only very few single fragments are found at the long sides or next to the opposite end of the hearths. Phosphate analyses (mainly reflecting bone disposal) have produced soil signatures that are in remarkable concordance with this pattern (Bakke & Haavik 2008; Jerand & Grabowski 2010; Linderholm 2013; Linderholm & Jerand 2014, see also Halinen *et al.,* 2013).

In order to find out whether there were any differences between the assemblages found inside and outside of the hearths, the reindeer bones found outside two of the richest hearths, H3 at Steintjørna and H5 at Brodtkorbneset, was analyzed with respect to their anatomical distribution. The question was whether the distribution pattern would reveal any distinct features for the bones deposited outside the hearths. The analysis gave no such indication and the result actually revealed a very similar pattern for the two hearths (Figure 9); deficiencies of skull bones in both cases, a pre-

dominance of bones from lower part of the extremities, and quite a lot of fragments from the meaty parts of the trunk and upper parts of extremities. As already mentioned, this reflects the general pattern that goes for the whole faunal material from the two sites, burned or unburned. Thus there seem to be no obvious differences between the bones deposited inside and outside of the hearths.

How then do we explain the remarkably uniform pattern in bone refuse disposal? One seemingly obvious interpretation of this pattering is that it reflects refuse clearance and butchering activities structured by the orientation of hearths and thus the entrances. Being systematically oriented perpendicular in relation to the row, the entrances to each dwellings at the respective sites all faced the same direction and thereby led to a uniform spatial patterning of refuse disposal. This understanding is, however, complicated by ethnographic information regarding Sami organisation of domestic space. As summarized – and probably somewhat idealized - by ethnologist Gustav Ränk (1949), the hearth mediated a basic social and cosmological dualism between the front and back spaces in the *goahti*, as also reflected by its two opposite entrances. The inner part of the dwelling (the *boassu* area) is reported as a male exclusive area, leaving the mid and front part as the female and common domain. The *boassu* was considered sacred, as was the attached second (back) entrance. Sacred objects and hunting weapons were stored here, and as with the slaughtered wild animals they could only enter the *goahti* through the second doorway (cf. Yates 1989). However, the *boassu* area also served as the kitchen area of the dwelling, the place where fish and especially reindeer meat were cut and prepared for cooking. Thus, according to the ethnographic narrative, it may well be the rear side of the dwelling that leaves the most visible imprints in the archaeological and soil chemical record.

Figure 7. Distribution of artefacts and bones in the H3 area, Steintjørna.

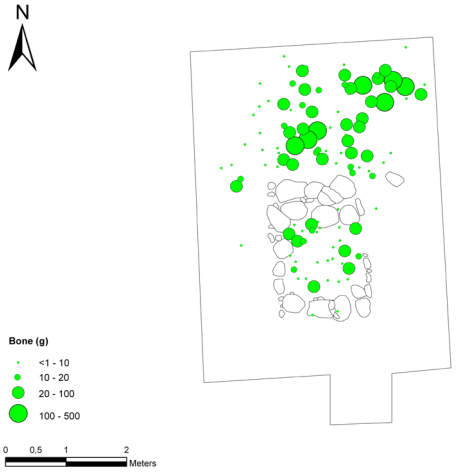

Figure 8. The distribution of bones (weight units) in the H5 area, Brodtkorbneset.

However, as often is the case, the archaeological record is not unconditionally willing to comply with the often too neat conceptions accounted for in the ethnographic descriptions. It is curious to note that the clear spatial patterning of bone refuse is not matched by the artefact distribution at the two sites. Artefacts are found evenly distributed around the hearth, with most of them next to the long sides (Figure 7). These divergent patterns of distribution could indicate that the deposition of bones were more subjected to the prevailing social and cosmological schemes and associated rules for how and where to handle meat and food within and next to the dwelling (cf. Ränk 1949, Mebius 1968, Edsman 1994, Grydeland 2001). Still, the available archaeological material from Brodkorbneset and Steintjørna also provides other "deviant" expressions. According to the ethnographic "norm", domestic products such as milk, and also domesticated animals (e.g. goats and sheep), should be kept separate from game and 'wild' products and should enter the house through the front entrance (Yates 1989). The fact that the bones of sheep are found in the same deposits as reindeer, other wild animals, birds and fish, provides yet another cautionary tale about being too overenthusiastic in reading the ethnographic record into our archaeological interpretations. A similar reminder is provided by the observation that there are no discernible differences between the bones found inside and outside of the hearths.

This is not to say that cosmological schemes and ritual practices have not impacted on the spatial patterns observed. The discrepancies in artefact and bone distribution is still intriguing, and though waste removal and cleaning through a single and equally oriented entrance may account for the repeated pattern of bone distribution, it does not explain all features of these deposits. This includes the many finds of complete ornaments and implements inside and outside of the hearths, and also the tendency that the arrows appear in the "bone rich" (male?) section of the dwelling. Intriguing is also a deposit north of Hearth 3 at Brodtkorbneset where bones of sheep were found together with a rare iron axe and two trapezoid pendants. May sheep have had significance beyond subsistence and practical utility, for example, in relation to the negotiation of external relations and trade?

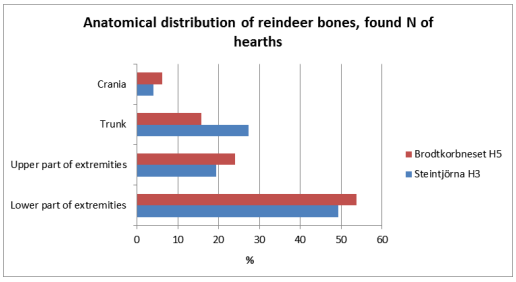

Figure 9. Anatomical distribution of faunal material found outside hearths H3 Steintjörna and H5 Brodtkorbneset.

Conclusion

The two investigated sites in Pasvik have brought to light rich data that significantly add to and nuance current knowledge about hearth row sites, Sami economy and dwelling, as well as the wider changes that took place in Sami societies during the Viking Age and Early Medieval Period. As discussed above, the new results also provide thought provoking supplement and challenges to narratives based on the ethnographic record. They furthermore call into questions common socioeconomic taxonomies and stereotypes separating hunters from herders, and "simple" and local societies from more "complex" and connected ones.

The recovered bones and artifacts speak to competences in trade and metal processing, to far-reaching contacts and exchanges, to intricate ways of organizing domestic space, and to continuity and change in the age-old and intimate

companionship between human and reindeer. Recalling how fur and dried pike left Pasvik for consumption at faraway places, how ornaments from Ladoga became part of local dress codes, and how sheep bleats started to blend in with native boreal voices, they allow for other and alternative accounts than those hitherto narrated. And by stubbornly disregarding any prevailing anthropological nomenclature of life forms, they bluntly suggest that those who tented at the Pasvik hearth row sites nearly a millennium ago may well have been both hunters and herders and that their pastoral skills may have included more than reindeer.

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Jägare, renskötare och härdar: Tolkningar av nya resultat från linjärt organiserade härdboplatser i Pasvik, nord Norge.

Abstract in Swedish/Sammanfattning: Renskötselns start och uppkomst är en fråga som diskuterats ingående i ett flertal arkeologiska arbeten. Arkeologiska undersökningar som nyligen har genomförts av två lokaler med linjärt organiserade härdar i Pasvik, Finnmark, har frambringat material som kastar nytt ljus över denna fråga. Lokalerna dateras till perioden 1000-1300 e.kr. och är unika i sitt slag genom det omfattande osteologiska materialet som har framkommit. Benmaterialet består primär av renben (87 %), men har också ett betydligt inslag av fisk. Även fårben har framkommit. Det som också gör materialet speciellt är att deponeringen följer ett mycket likartat rumsligt mönster på de två lokalerna. Baserat på osteologiska analyser av benmaterialet diskuteras frågor kring säsongstillhörighet, bosättningsmönster, boplastsorganisering och förändringer i det ekonomiska nyttjandet av renen. Resultaten ger nya infallsvinklar kring den tidiga domesticeringen och de stora förändringar som uppstod inom det samiska samhället under vikingatid och tidig medeltid.

Appendix

Table 7. AMS radiocarbon dates from Brodtkorbneset. Dates calibrated using OxCal 4.2 (Bronk Ramsey 2009).

Lab. no	Heart	Material	Age in years BP	Calibrated date AD 2 sigma
Ua-39039	H1	Burned bone (reindeer)	738±30	1224-1293
Ua-39040	H1	Burned bone (reindeer)	998±46	906-1160
Ua-39047	H1	Unburned bone (reindeer)	703±30	1260-1386
Ua-39033	H1	Charcoal (pine)	828±30	1162-1264
Ua-39046	H2	Burned bone (reindeer)	753±30	1221-1286
Ua-39042	H2	Burned bone (reindeer)	788±34	1186-1281
Ua-39041	H2	Burned bone (reindeer)	953±39	1015-1168
Ua-39037	H2	Charcoal (pine)	354±30	1454-1635
Ua-37594	H3	Charcoal (pine, 4-5 years outer growth rings)	790±35	1182-1280
Ua-37595	H3	Charcoal (pine, branch)	905±35	1035-1209
Ua-37598	H3	Unburned bone (reindeer)	705±30	1259-1385
Ua-37599	H3	Unburned bone (reindeer)	690±35	1261-1391
Ua-37600	H3	Unburned bone (reindeer)	820±30	1165-1265
Ua-37601	H3	Unburned bone (reindeer)	775±35	1190-1285
Ua-37602	H3	Burned bone (reindeer)	800±30	1184-1275
*Hela-2324	H3	Unburned bone (sheep)	984±31	990-1155
Ua-39038	H4	Charcoal (pine)	794±30	1190-1277
Ua-39043	H4	Burned bone (reindeer)	801±30	1182-1275
Ua-39044	H4	Burned bone (reindeer)	964±31	1019-1155
Ua-39050	H4	Unburned bone (reindeer)	754±30	1221-1286
Ua-37603	H5	Charcoal (pine, 10 years outer growth rings)	825±35	1156-1272
Ua-37604	H5	Charcoal (pine. 2 years outer growth rings)	950±35	1021-1161
Ua-37605	H5	Burned bone (reindeer)	910±35	1032-1206
Ua-37606	H6	Charcoal (pine, 7 years outer growth rings)	895±30	1039-1215
Ua-37607	H6	Charcoal (pine, 10 years outer growth rings)	945±35	1021-1163
Ua-37608	H6	Burned bone (reindeer)	830±35	1059-1271
Ua-39034	H7	Charcoal (pine)	850±30	1052-1260
Ua-39045	H7	Burned bone (reindeer)	1344±94	535-896
Ua-39034	H7	Burned bone (reindeer)	753±30	1221-1286

* All the dates were processed at the Ångström Laboratory in Uppsala, Sweden, except the sample of unburned bone from sheep which was processed at the Laboratory of Chronology at the Finnish Museum of Natural History, University of Helsinki, Finland (Niemi *et al.,* 2013:4).

Table 8. AMS radiocarbon dates from Steintjørna. All the dates were processed at the Ångström Laboratory in Uppsala, Sweden. Dates calibrated with OxCal 4.2 (Bronk Ramsey 2009)

Lab. no	Hearth	Material	Age in years BP	Calibrated date AD 2 sigma
Ua-47238	H1	Burned bone (reindeer)	965±30	1018-1155
Ua-47472	H1	Charcoal (pine,7 years outher growth rings)	945±32	1024-1158
Ua-48511	H1	Unburned bone (reindeer)	743±30	1223-1290
Ua-47239	H2	Burned bone (reindeer)	867±32	1045-1254
Ua-47473	H2	Charcoal (pine,10 years outher growth rings)	870±32	1045-1250
Ua-48510	H2	Unburned bone (reindeer)	766±30	1218-1283
Ua-47240	H3	Burned bone (reindeer)	1028±35	899-1147
Ua-47474	H3	Charcoal (pine, outher growth rings)	950±33	1022-1158
Ua-47832	H4	Burned bone (reindeer)	935±32	1024-1164
Ua-47833	H4	Charcoal (pine, outher growth rings)	963±30	1019-1155
Ua-48506	H4	Unburned bone (reindeer)	766±30	1218-1283
Ua-47835	H5	Charcoal (pine)	771±32	1211-1285
Ua-48508	H5	Unburned bone (reindeer)	718±30	1246-1366
Ua-47836	H6	Burned bone (reindeer)	885±30	1041-1220
Ua-47837	H6	Charcoal (pine, outher growth rings)	812±30	1169-1268
Ua-48505	H6	Unburned bone (reindeer)	759±30	1220-1285
Ua-47838	H7	Burned bone (reindeer)	899±30	1039-1211
Ua-47839	H7	Charcoal (pine, outer growth rings)	1078±30	894-1019
Ua-48507	H7	Unburned bone (reindeer)	1062±30	897-943
Ua-47840	H8	Burned bone (reindeer)	933±30	1026-1163
Ua-47841	H8	Charcoal (pine, outher growth rings)	1032±30	901-1040
Ua-48509	H8	Unburned bone (reindeer)	783±30	1206-1281